

## Extended Abstract

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<b>Paper/poster Title</b>	<b>Water use in agriculture under growing water scarcity: Comparing policy options and listening to stakeholders across Europe, Israel and China</b>
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Abstract prepared for presentation at the 96<sup>th</sup> Annual Conference of the Agricultural Economics Society, K U Leuven, Belgium

4<sup>th</sup> – 6<sup>th</sup> April 2022

<b>Abstract</b>	<i>200 words max</i>
<p>Globally, agriculture consumes the majority (70%) of available freshwater. Thus, irrigated agriculture is greatly affected by declining freshwater resources because of an increasing world population and climatic changes; and as such, agriculture plays a crucial role in addressing and adapting to declining water resources. It is important to continuously improve the adoption of innovations and to increase water use efficiency and productivity in irrigated agriculture. We provide an overview of the different policies affecting water and soil management as well as compare the status regarding water scarcity, water efficiency and water innovation adoption level amongst several European countries as well as Israel and China. Thereby, we obtain a clearer picture of the synergies, opportunities and constraints of several policy implementations. The aim is to gain a deeper understanding into the framework of water efficiency and other environmental problems in agriculture and to understand similarities and differences among farmers in the different countries. We conducted a number of focus groups in Austria, Spain, Czech Republic, Israel and China to evaluate the farmers' attitudes towards soil and water management using a participatory approach. Finally, we draw recommendations for effective implementation of policy principles through increased context-focused governmental action and stakeholder involvement.</p>	
<b>Keywords</b>	Water economics, Technology, Irrigation, Stakeholder involvement
<b>JEL Code</b>	Q18, Q24, Q25, Q28
<b>Introduction</b>	<i>100 – 250 words</i>
<p>Freshwater is becoming an increasingly scarce resource worldwide. Many (southern) European countries already experience droughts and water scarcity. China's water stress levels vary across the regions, with the northern regions experiencing medium to high water stress levels. Irrigated agriculture is greatly affected by declining freshwater resources; and hence, it is important to continuously improve the adoption of innovations and water use efficiency/productivity levels. The change in water use efficiency over time is one important indicator of the Sustainable Development Goal 6 (SDG 6) and has not been continuously monitored at a consistent and global scale. The EU provides general directions and frameworks to deliver policy options to combat water scarcity in addition to country specific regulations. It is our objective to examine water management and land use policies in Europe as well as China and</p>	

Israel showing the variety of water regulations frameworks existing. Further, we added a participatory approach by conducting focus groups with farmers in Austria, Czech Republic, Israel, Spain and China. It is the objective to evaluate farmers' attitudes towards water and soil management options and to include a stakeholder perspective in our policy recommendations. Farmers are looking for new solutions for improving their soil and water management. Thus, we present an overview about the real farmers management preferences.

**Methodology**

*100 – 250 words*

We evaluate the attitude of land users (farmers and vintners) towards sustainable water use and soil/water management practices with a participatory approach by using focus groups. Participatory methods have received growing attention because of the need to include non-scientists in the production and use of scientific knowledge. There is also growing consensus that effective responses to sustainability challenges demand the integration of outside and non-scientific actors into policy making processes. Focus groups are a commonly employed participatory method and have been shown to provide valuable insights into principles, techniques and procedures. We are following the qualitative content analysis approach with a conventional approach of developing codes during the data analysis and therefore an inductive category development. We conducted homogenous focus groups in different regions in Austria, Israel and China (Gangsu Province) in 2019 and 2020. Additional focus groups were conducted in Spain and Czech Republic which are used to support our findings. The landowners, farmers and vintners were recruited for the focus groups by local research partners. The questions were non-constraint in order to observe how farmers reflect on their management practices and choices and to facilitate collective exchanges.

**Results**

*100 – 250 words*

This paper first highlights the differences among countries relating to water and climate policies and governance levels. For example, Spain and UK show a kind of place-based approach (catchment, water district) while others adopt a centralized system. Institutional arrangements for irrigation management considerably vary at national and local levels. This becomes visible when having a closer look into the national legislation for Austria or the UK. The discussion round with stakeholders underline this individual regulation in different Austrian regions. These variations in water management regulations is found as much within individual countries as between them.

The potential for water savings and the uptake of innovations also differ between the countries. While in some countries, such as the UK, conservation tillage is a promising approach, in Austria this is no longer sufficient due to global warming. Water use efficiency has long been discussed in the Mediterranean countries, but this topic is relatively new for the UK or Czech Republic. Furthermore, water rights are a key issue and were controversially discussed amongst the stakeholders in Austria. Also, improved irrigation schedules are key measures. But the need for training and further education on efficient irrigation was an important topic in the focus groups.

The results of the qualitative content analysis overall show that according to the focus groups the following 6 categories are of main concern for stakeholders:

improving water management aspects; cover crop use; typical soil management; statements about politics and public; details about water use; and future prospects.

**Discussion and Conclusion**

**100 – 250 words**

Different policy approaches are discussed. For example, with a place-based policy approach it is possible to adopt a more tailored strategy to the local needs, whereas a national perspective can benefit a coordination between places, policy objectives and economic sector needs. Metering and water pricing are becoming very important policy options both in Europe and China. However, an increase in water price may be more easily “absorbed” by big and competitive farms which can accentuate the competitive divide among territories. Agricultural water pricing as Israel implemented it, is a story of success; however, positive as well as negative effects must be considered.

The stakeholder involvements reflect a huge variety of water use in irrigation from the “rule of thumb” (Austria) to highly developed technology in irrigation systems supported by irrigation schedules (Israel, Spain). Across all partner countries, the main best management practices from farmers perspective are: cover crops in tree crops; mulching in tree crops; conservation agriculture; cover crops in annual crops; and increasing soil water capacity. We concluded that the current supporting measures in the different countries are not fully targeted and may thus hinder technological/innovative progress.

For future research, the water saving potentials need to be worked out in more detail. We point out missing external conditions that become in some regions a clear obstacle for innovation adoption levels (e.g. the availability pressurized pipes).

Israel is a leading country with regards to water management and most of the participating stakeholders were specially trained. This should be a positive example for other countries.